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# Taxonomy of Assistive Technology

## Blind and Visually Impaired

### Screen Readers

Screen readers provide the ability to interact with digital content without the use of a mouse and with limited-to-no visual input.

“Screen readers are software applications that transform the code behind visual user interfaces into synthesized speech.”

Screen readers can also transform the code behind visual user interfaces into Braille on a refreshable Braille display.

When screen readers speak all of the content on the page without stopping, the content is presented in a particular order, called the reading order.

Screen reader users usually use keyboard keys to navigate. Screen readers provide access to buttons, links and other controls.

There are many reading options and commands. When detailed analysis is needed, screen reader users can step through sentences by word and through words by character.

Screen readers are available for desktop computers, laptop computers, tablet computers, mobile phones, music devices and more. This includes touch screens like iPad and iPhone, where users use gestures to control the screen reader.”1

#### Example Screen Readers:

1. JAWS
2. WindowEyes
3. NVDA
4. VoiceOver for the Mac and iOS devices

#### Students who may benefit from screen reader support:

1. Students who are classified as “totally blind.”
2. Students who are classified as “low vision.”

### Refreshable Braille Displays

Refreshable Braille Displays work in conjunction with Screen Readers. Screen readers translate digital text into Braille, which is then appears on the display as the user moves the cursor through the text. Refreshable Braille displays have to be used in conjunction with a screen reader, so basically, if a screen reader can access the content, so can a refreshable Braille display. Refreshable Braille displays have varying numbers of Braille Cells, the most common being 18, 20, 32, 40, and 80-cell displays.

For testing purposes, Criss Cole Rehabilitation services recommends refreshable Braille displays that have a minimum of 32 Braille cells because that will allow the user to see the equivalent of a line of Braille text on an 8.5x11 piece of paper.

#### Examples of Refreshable Braille Displays:

1. Braille Lite Millennium
2. Braille Wave
3. Brailliant
4. Focus Braille

#### Students who may benefit from refreshable Braille displays:

* Students who are proficient with grade 2 Braille and/or Nemeth code and prefer to use Braille.

### Braille Notetakers

Braille Notetakers allow users to input text with a Braille Keyboard. They can be connected to desktop computers as an alternative keyboard option.

#### Examples of Braille Notetakers:

1. Pac Mate Omni
2. Focus Braille
3. Voice Sense
4. Braille Note
5. Voice Note

#### Students who may benefit from the use of Braille Notetakers:

* Students who are proficient with Braille and/or Nemeth Code and use Braille Notetakers as a regular part of their instruction to complete written assignments.

### Talking Calculators

Talking Calculators have built-in speech synthesizers that provide audio feedback for every key that is pressed on a calculator. They also vocalize the answer for the user.

#### Example Talking Calculators:

1. Orion TI-84 Plus – a talking, graphing calculator
2. 8-digit talking calculator
3. Big Number Talking Calculator

#### Students who may benefit from the use of a talking calculator:

* Students who are blind or visually impaired
* Students with dyscalculia
* Students with visual processing difficulties
* Students who process audio input more effectively than visual input

### Braille Translation Software

Braille Translation Software converts text into Grade 2 Braille, which is contracted Braille.

#### Examples of Braille Translation Software:

1. Duxbury
2. Megadots

#### Students who may benefit from Braille Translation Software:

* Braille readers who need text converted into Braille.

### Braille Embossers

Braille Embossers print Braille-ready files and tactile graphics.

#### Examples of Braille Embossers:

1. EmBraille
2. ViewPlus Series (Cub, Elite, Max)
3. Everest
4. Romeo
5. Tiger

#### Students who may benefit from the use of a Braille Embosser:

* Braille Readers who need access to Braille and/or tactile graphics.

### Dynamic Tactile Graphics Displays:

Tactile Graphic Displays convert graphics on a screen into a tactile representation, in real time.

#### Examples of Dynamic Tactile Graphics Displays:

1. DOT View Series Tactile Graphics Display

#### Students who might benefit from the use of a Tactile Graphic Display

* Students with blindness or low vision who use dynamic tactile graphic displays as a regular part of their instruction.

### Zoom / Magnification

Zoom / Magnification tools allow users to enlarge text and images on a computer screen.

#### Examples of Zoom / Magnification Tools

1. ZoomText (allows the user to enlarge text, get text-to-speech support, and modify foreground and background color combinations)
2. MAGic (allows the user to enlarge text, get text-to-speech support, and modify foreground and background color combinations)
3. Built-in OS Magnification Tools (e.g. Windows Magnifier from Ease of Access Options, Macintosh Zoom Feature)
4. Browser Magnification Tools (Ctrl-(+) / Ctrl-(-))

NOTE: Screen magnification software denotes magnification in X-values. These values have to do with the amount of the screen that is visible to the user when it is magnified.  
  
For example - ZoomText has 1.25x - 36x. At 1.25x, the user is able to see about half of the screen at a time; at 36x, the user can see about 3, 12-point-font-sized characters at a time.  
  
Equivalents for ZoomText to Ctrl-+ Magnification Levels would be:  
  
2x=200% ; 3x=250%; 4x=300%; 5x=250%; 6x=400%; 8x=500%; 10x=750%; 16x=1000%  
  
What can a user see at one time?  
@2X - user sees 1/4th of the screen  
@4x - user sees 1/8th of the screen  
@6x - user sees 1/16th of the screen  
@8x - user sees 1/32nd of the screen

#### Students who might benefit from Zoom/Magnification support:

* Students with low vision

## Reading

### Text-to-Speech

Text-to-Speech software consists of third-party applications that read digital text in the form of eText, Internet sites, email, word processing applications, etc. Not all text-to-speech tools can work with every kind of digital text.

#### Example Text-to-Speech Applications:

1. Read and Write Gold
2. My Study Bar
3. Read:Outloud
4. ReadPlease
5. Natural Reader
6. Microsoft Reader
7. Universal Reader
8. ClipRead / Live Ink
9. WordTalk, a plug-in for Microsoft Word

#### Students who might benefit from TTS support:

* Students who are unable to access standard print.
* Students with severe learning disabilities in the area of reading
* Students with dyslexia

### Digital Vocabulary Support

Vocabulary supports include electronic dictionary, thesaurus, homonym checker, and text translation support.

#### Examples of Digital Vocabulary Support:

1. Read and Write Gold
2. Lingo Voyager
3. Franklin Speller / Dictionary & Thesaurus

#### Students who may benefit from digital vocabulary support:

* English Language Learners (ELL)
* Students with dyslexia
* Students with language processing disorders
* Students with short-term or long-term memory deficits
* Students with spelling deficits

### eText Readers

eText Readers read digital text that is in DAISY or ePUB format, and/or other proprietary formats and many of them allow for navigation and annotation of text.

#### Examples of eText Readers:

1. Read and Write Gold
2. Learning Ally App
3. Read:Outloud
4. Read2Go
5. ReadHear

#### Students who may benefit from using eText Readers:

* Students who are unable to access standard print materials

### Academic Suite Software – Self-Contained

See description under *Writing & Spelling*

### Academic Suite Software – Companion

See description under *Writing & Spelling*

### Screen Readers

See description under *Blind and Visually Impaired*

### Color & Font Customization

Color and Font Customization allows users to choose the foreground and background colors that best support their learning, as well as the font face that is easiest for them to read.

#### Examples of Color and Font Customization:

1. Open Dyslexic Font
2. Read & Write Gold – provided color customization for many of the embedded tools
3. Write:Outloud
4. Microsoft Word

#### Students for whom color and font customization may be helpful:

* Students with visual perception difficulties
* Students with dyslexia
* Students with low vision

### Text-to-Audio Conversion (Optical Character Recognition – OCR)

#### Examples of Text-to-Audio Conversion

* Read and Write Gold
* Snap&Read
* Kurzweil

#### Students who may benefit from text-to-audio conversion:

* Students with dyslexia
* Students with visual processing disorders
* Students with language processing disorders
* Students who are blind or low vision

### Augmentative and Alternative Communication (AAC) Devices

Augmentative and Alternative Communication (AAC) Devices are used by students with speech and/or language disorders to express thoughts, needs, wants, and ideas and to access electronic text with text-to-speech feature.

#### Examples of Augmentative and Alternative Communication (AAC) Devices:

All of the following companies have eye gaze interfaces

1. Maestro, V, VMax, Express (by Dynavox)
2. Accent, ECO2 (by Prentke Romich)
3. C15, C12, I-Series – eye gaze(by Tobii)

#### Examples of students who may benefit from the use of AAC devices:

* Students with speech and/or language disorders who cannot effectively communicate orally

## Writing & Spelling

### Word Prediction

Word Prediction software interfaces with other word processors / text editors to help students with writing. As the student types, word predication software uses context, spelling, syntax, and user vocabulary patterns to predict the word a student may be trying to type.

#### Example Word Prediction Applications:

1. Co:Writer
2. Read and Write Gold
3. WordQ
4. Abilipad

#### Students who may benefit from word prediction support:

* Students with dysgraphia
* Students with dyslexia
* Students with spelling difficulties
* Students with motor impairments
* Students with processing disorders
* Students with language disorders (e.g. may have word recall issues)

### Phonetic Spell Check

Phonetic Spell Check supports return spelling options to users, based on phonemes, rather than typographical errors. These tools support flexible spelling, such as students who write without vowels.

#### Examples of Phonetic Spell Check Supports:

1. Franklin Spellers
2. Read and Write Gold
3. Write:Outloud

#### Students who may benefit from phonetic spell check supports:

* Students with dysgraphia
* Students with dyslexia
* Students with processing disorders
* Students with spelling difficulties

### Talking Word Processors

Talking word processors are fully functional word processors that provide embedded text-to-speech. These applications do not work in conjunction with other word processors or text environments and they have a proprietary file format. Sometimes they will have the ability to import and export other file formats.

#### Examples of Talking Word Processors:

1. Write:Outloud
2. Classroom Suite
3. Writing with Symbols

#### Student who may benefit from Talking Word Processors:

* Students with spelling difficulties
* Students with processing disorders
* Students with dysgraphia

### Graphic Word Processors

Graphic Word Processors are software applications that pair picture symbols with printed text. As text is typed, a picture symbol is inserted to correspond to the typed text.

#### Examples of Graphic Word Processors

1. Writing with symbols
2. Clicker
3. Pixwriter
4. Classroom Suite

#### Students who may benefit from Graphic Word Processors:

* Students with reading difficulties
* Students with language processing disorders
* Students with communication disorders

### Concept Webbing

#### Examples of Concept Webbing Software:

1. Kidspiration
2. Inspiration
3. Webspiration
4. Draft:Builder

#### Students who may benefit from Concept Webbing Software:

* Students with memory deficits
* Students with Traumatic Brain Injury
* Students with processing disorders
* Students with organizational deficits

### Academic Suite Software – Self-Contained

Self-Contained Academic Suite Software consists of products that provide a wide range of literacy supports within a proprietary environment. These supports may include text-to-speech, word prediction, phonetic spell check, annotation tools, concept webbing or outlining support, Optical Character Recognition (OCR) scanning, etc. Text and websites are opened within this environment and manipulated with the tools that are available. They often require that files or internet sites be opened within the academic suite’s proprietary environment. They may include export and import capabilities that will allow the user to read and share other file types.

#### Example Self-Contained Academic Suite Software:

1. Classroom Suite
2. SOLO
3. Wynn
4. Kurzweil

#### Students who may benefit from Self-Contained Academic Suite Software:

* Students with learning disabilities in reading and/or writing
* Students with visual disabilities
* Students with physical disabilities

### Academic Suite Software - Companion:

Companion Academic Suite Software provides tools that interface with other applications on a computer, such as Microsoft Office, the Internet, email, etc. They do not require users to work within a proprietary environment. These tools may include phonetic spell check, word prediction, annotation and highlighting tools, calculators, text-to-speech, text-to-sound file conversion, translation support, vocabulary support, OCR scanning, etc.

#### Examples of Companion Academic Suite Software:

1. Read and Write Gold
2. My Study Bar

#### Student who may benefit from Companion Academic Suite Software:

* Students with learning disabilities in reading and/or writing
* Students with visual disabilities
* Students with physical disabilities
* English Language Learners (ELL)

### Augmentative and Alternative Communication (AAC) Devices

Augmentative and Alternative Communication (AAC) Devices are used by students with speech and/or language disorders to express thoughts, needs, wants, and ideas.

#### Examples of Augmentative and Alternative Communication (AAC) Devices:

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#### Examples of students who may benefit from the use of AAC devices:

* Students with speech and/or language disorders who cannot effectively communicate orally

### Speech-to-Text

Speech-to-text (STT) software translates the user’s speech into text that can be input into word processing software, email, etc. Users have to train the computer to understand their voice patterns. Implications for testing are that student voice profiles will need to be installed onto computer systems that are used for testing and access to those files must be granted through the test security system.

#### Examples of Speech-to-Text software:

1. Dragon Naturally Speaking
2. Speak-Q
3. Windows Speech Recognition
4. Read and Write Gold (Uses the Windows Speech Recognition Engine)
5. My Study Bar (Uses the Windows Speech Recognition Engine)

#### Students who may benefit from Speech-to-Text software:

* Students with severe physical disabilities
* Students who are medically fragile and fatigue easily
* Students with severe dysgraphia

## Physical/Motor

### Alternative Keyboards

Alternative Keyboards can be hardware devices that connect via USB or Bluetooth. They can also be software-based through third-party applications, or through features built into the operating system.

#### Examples of Alternative Keyboards:

1. Augmentative and Alternative Communication (AAC) Devices
2. Intellikeys
3. Big Keys
4. Big Bright Keyboards
5. Miniature Keyboards
6. Ergonomic Keyboards
7. Braille Notetakers
8. Refreshable Braille Displays that incorporate a Braille keyboard
9. Onscreen Keyboards – can be through external software or through OS accessibility features
10. Softstep Keyworx – a foot-operated keyboard
11. Morse Code via switch interfaces
12. Eye Gaze System
13. Abilipad
14. Discover:KENX

#### Students who may benefit from Alternative Keyboards:

* Students who are blind or visually impaired
* Students with fine and/or gross motor difficulties
* Students with severe physical limitations
* Students with no use of their arms and/or hands
* Students who use Augmentative and Alternative Communication (AAC) Devices for written work

### Keyboard Modifications

Keyboard modifications can be made to standard or alternative keyboards. These modifications can be physical modifications, such as large print stickers on the keys or keyboard stands. They can also be software modifications, such as enabling sticky keys or scanning.

#### Examples of Keyboard Modifications:

1. Sticky Keys – built into operating systems as an access feature – allows users to press a modification key (e.g. shift, ctrl, alt) and then press the combo key for any multi-key commands they may need to enter.
2. Scanning technologies move the computer’s focus from item to item on the screen. The user presses a switch when the scan highlights the option or key they would like to select. This can be used in conjunction with other modifications, such as sticky keys. Scanning Access is often built into:
   1. third-party scanning software or onscreen keyboard programs
   2. onscreen keyboards that are into operating system access features
   3. alternative keyboards that are connected to computers as a peripheral device
3. Half-QWERTY Software
4. Perky Duck – software to transform sdf-jkl-space on a standard keyboard, into a Braille Keyboard
5. Morse Code

#### Students who may benefit from keyboard modifications:

* Students who are blind or visually impaired
* Students with fine and/or gross motor difficulties
* Students with no use of their arms and/or hands
* Students who use alternative augmentative communication devices for written work

### Alternative Mice / Pointing Devices

There are a variety of direct selection methods that may be used by students with disabilities. These devices are simply modifications to a standard mouse interface and they are designed to perform the same functions as a standard mouse.

#### Examples of Alternative Mice / Pointing Devices for Direct Selection:

1. Touch Screen
2. Keyboard Navigation
3. Joystick
4. Trackball
5. Head Pointing
6. Sip and Puff switch with switch interface
7. Single switch with switch interface device
8. Dual/Multi switch with switch interface device

#### Students who may benefit from alternative mice or pointing devices for direct select:

* Students who are blind or visually impaired
* Students with fine and/or gross motor difficulties
* Students with no use of their arms and/or hands
* Students who use alternative augmentative communication devices for written work

### Switch Access

Switch access is for those with severe physical disabilities that may prohibit the use of a mouse or other pointing interfaces. Switch access allows users to interact with computer and software controls and requires the use of a switch interface device.

#### Examples of Switch Interface Devices:

1. Don Johnston Switch Interface
2. Intelliswitch

#### Examples of Switches

1. Sip, Puff, and Hands-free switches
2. Proximity
3. Single switch
4. Dual/Multi switch
5. Voice Activated
6. Foot Switches
7. Finger
8. Tilt
9. SCATIR
10. Sensor
11. Wireless

#### Students who may benefit from switch use:

* Students with severe physical disabilities
* Students with severe cognitive disabilities

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